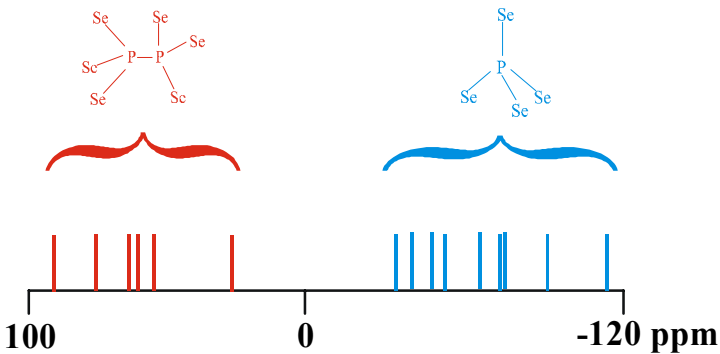


Acquisition of a 400 MHz Solid State Nuclear Magnetic Resonance (NMR) Spectrometer – DMR 9977650

David P. Weliky, Michigan State University, Department of Chemistry

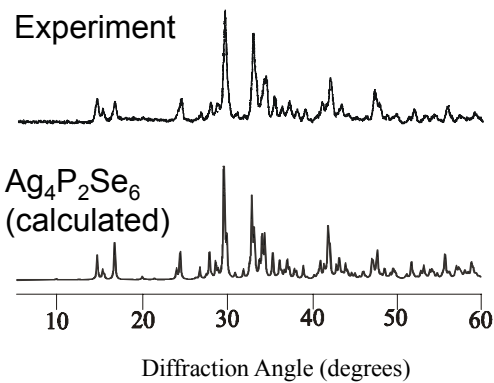
Applications to Inorganic Materials (Mercouri Kanatzidis and David Weliky): Using molten salt synthesis, a significant number of different metal selenophosphates can be synthesized which have an impressive diversity of selenophosphate anions. ^{31}P NMR studies on the solid products provide insight into the electronic structure of these anions and serves as an analytical tool for compound identification and quantitation.

Chemical shift correlation with P–P bonding

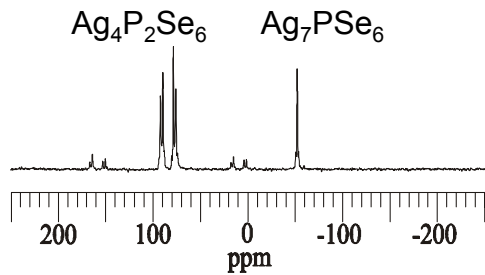


Impurity identification

Powder Diffraction: pure $\text{Ag}_4\text{P}_2\text{Se}_6$?



Solid State NMR: 20% Ag_7PSe_6 impurity!

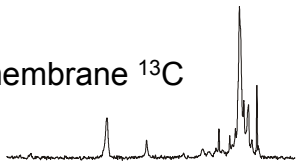


Applications to Biochemistry

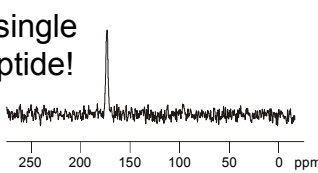
(David Weliky): Fusion peptides are domains of viral proteins which catalyze fusion of viral and target cell membranes. This process is a key step in viral infection. Solid state NMR methods are being applied to understand fusion peptide-membrane interactions.

REDOR-Filtering of Labeled ^{13}C

Unfiltered: mostly membrane ^{13}C

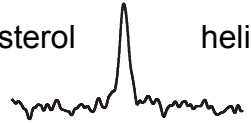


Filtered: observe a single labeled ^{13}C from peptide!

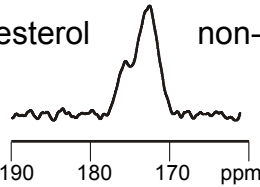


Peptide structure is cholesterol-dependent

No cholesterol helical

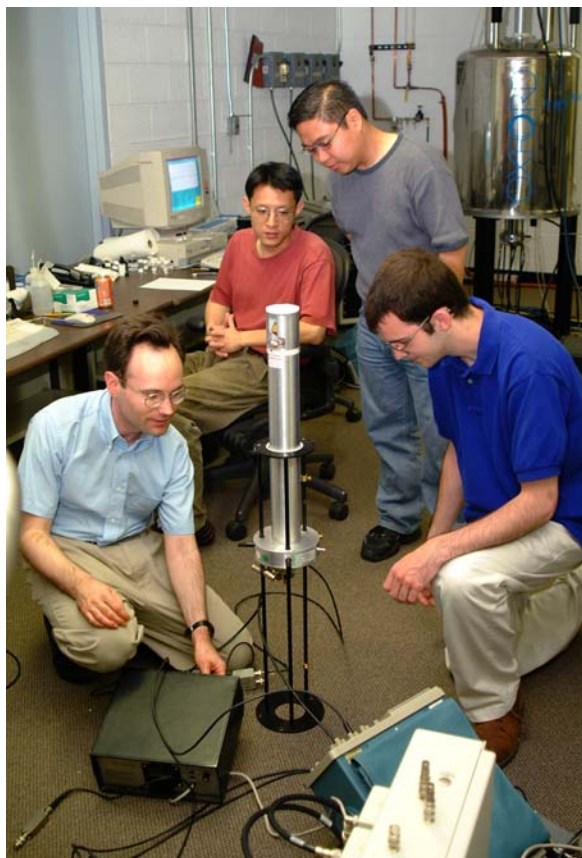


30% cholesterol non-helical



Acquisition of a 400 MHz Solid State NMR Spectrometer – DMR 9977650

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Education

The NMR is used on a regular basis by 1 undergraduate, 15 graduate students, 7 postdoctoral fellows, and 7 faculty. The students who use the instrument are in a broad range of fields ranging from inorganic and materials chemistry to physics and biochemistry. Some students use the solid state NMR as a tool for analysis of Si and Al coordination in clay materials while others use sophisticated multiple pulse NMR methods for structural and motional analysis of complex biomolecules.

Outreach

Michigan State has REU programs in the Chemistry and Physics departments. Dr. Weliky has spoken about solid state NMR at the weekly seminar series sponsored by each program.

Dr. Weliky demonstrates NMR probe tuning to graduate students. The instrument is in the foreground.